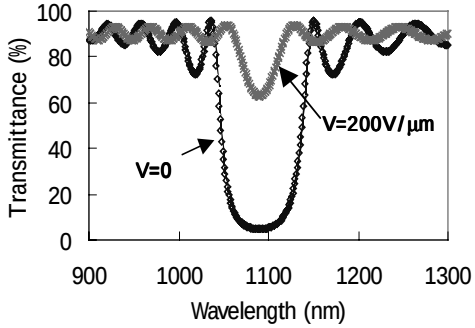
Ultra-fast optical switch using 1D polymeric photonic crystals

R. Katouf[(1)], T. Komikado[(2)], M. Itoh[(1)], T. Yatagai[(1)] and S. Umegaki[(2)],
[(1)] Institute of Applied Physics, University of Tsukuba, Tennodai 1-1-1, Tsukuba, Ibaraki, Japan.
[(2)] Faculty of Science and Engineering, Keio University, Yokohama, Japan.

Photonic Crystals for optical applications have been attracting increasing interest in recent years but polymers are seldom used in the fabrication of photonic crystals due to their low refractive index. However, recently we reported the fabrication of a 1D photonic crystal made by spin coating of polymers dissolved in solvent [1]. This method is simpler and has a low cost.

In this paper we report the simulation and fabrication results of ultra-fast optical switching at 1064nm using one-dimensional nonlinear polymeric photonic crystals, which have been fabricated by stacking alternating periodic multilayers of Poly(vinyl carbazole) PVK as the high refractive index layer and Poly(acrylic acid) PAA doped Disperse Red1 DR1 as the low refractive index layer.



We observed that the band gap became narrower due to the electro-optic effect in the low refractive index layers. The calculated transmission at 1064nm changed from 93% before applying the voltage (V=0) to 10% during application (V=200V/μm) as shown in the figure.

[1] R. Katouf et al, *65th Japan applied physics conference*, (2004).